REMARKS

Claims 1-5 are presently pending in the application.

Claims 1 and 2 have been amended to replace "SP" with "sulfur-phosphorus," as suggested by the Examiner. No new matter has been added by this amendment, and it is submitted that this amendment overcomes the §112, second paragraph indefiniteness rejection with respect to this element. Reconsideration and withdrawal of the §112 rejection are respectfully requested.

Claim 1 has also been amended to recite specific compounds which may be used as component (E), which amendment is supported in the specification at least at page 26, line 20 through page 27, line 1, and to recite that R^{11}, R^{14}, and R^{15} are each a straight chain or branched alkyl or alkenyl group having 12 to 25 carbon atoms, which is supported in the specification at least at page 22, lines 6-10. Finally, claim 2 has been amended to recite that the salts of the SP type extreme pressure additive are ammonia or amine salts, which is supported in the specification at least at page 19, line 22 to page 20, line 26. No new matter has been added by these amendments, and entry is respectfully requested.

In the Office Action, the Examiner has rejected claims 1-5 under 35 U.S.C. §103(a) as being unpatentable over each of U.S. Patents Nos. 6,617,286 of Sato et al. ("Sato"); 6,638,897 of Ogano et al. ("Ogano"); and 6,730,293 of Bovington et al. ("Bovington"). Applicants respectfully traverse these rejections and the arguments in support thereof as follows, and respectfully request reconsideration and withdrawal of the rejections.

The Presently Claimed Invention

The presently claimed invention is directed to a lubricating oil composition having long-lasting anti-shudder properties and long fatigue life, in particular, one which is suitable for automatic transmissions and continuously variable transmissions. It was generally known in the art that the addition of sulfur-based additives which provide excellent extreme pressure and anti-wear properties to an oil composition is effective in prolonging fatigue life. However, there have been problems stemming from the use of sulfur-based additives alone because they exhibit strong activity to metal surfaces, resulting in the wear thereof by corrosion.

On the other hand, in order to maintain anti-shudder properties, it is necessary to add a proper quantity of a friction modifier for maintaining friction performances in a lock-up clutch in a better state. However, the effects achieved by the addition of the friction modifiers are relatively low. Also, the use of sulfur-based additives and friction modifiers in combination

decreases the favorable effect of the friction modifiers on the anti-shudder properties in a good state because of the deterioration in the oxidation stability of the oil composition.

Applicants have discovered that prolonged anti-shudder properties and failure life may be remarkably improved by adding (D) specific succinimide compounds represented by formula (3) and/or (4) to an oil composition comprising (A) a base oil, (B) calcium salicylate having TBN of 50 to 300 mg KOH/g, (C) a sulfur- and phosphorus-type extreme pressure additive, and (E) a boron-containing ashless dispersant selected from (E-1), (E-2), and/or (E-3), each of which components is contained in a specific amount based on the total mass of the composition. That is, the features of the inventive composition reside in the inclusion of (D) a specific succinimide compound, i.e., a specific low MW succinimide, to a composition containing components (A), (B), (C), and (E).

The advantages achieved by the presently claimed composition are set forth in Tables 1-1 to 2-2 at pages 46-49 of the specification. Particularly, the effects achieved by the addition of Component (D) may be observed by comparing Inventive Example 2 and Comparative Example 7. Both examples are nearly the same except that the composition in Inventive Example 2 contains a specific succinimide compound as component (D). It is apparent from the results in the Tables that the oil sample of Comparative Example 7 was not able to provide satisfactory properties in terms of fatigue life and anti-shudder durability compared with that of Inventive Example 2. Such an improvement in properties of Inventive Example 2 relative to Comparative Example 7 may thus be attributed to Component (D).

Rejection Under §103(a) Based on Sato

The Examiner argues that Sato teaches a lubricating oil composition for continuously variable transmissions which comprises a lubricating base oil made of mineral oil and/or a synthetic oil formulated with a phosphorus-based wear preventative (A) (such as phosphate and phosphate esters which may contain sulfur atoms), a metal detergent additive (B), and an ashless dispersant additive (C), including boron-containing succinimides. Sato allegedly teaches that the base oil component has a kinematic viscosity of 0.5 to 200 mm^2/s at 100°C, preferably 2-25 mm^2/s at 100°C, and that mixtures of mineral oils and synthetic oils may be used in combination (see col. 3, line 43 to col. 4, line 43). Sato allegedly also teaches that the amount of the additive is within the range of 200-500 ppm as phosphorus based on the total weight of the composition (col. 4, lines 48-63). The Examiner contends that the metal detergent additive (B) includes

overbased calcium salicylates having a TBN ranging from 10-450 mg KOH/, and that the amount of metal detergent is preferably 100-1000 ppm as a metal content based on the total weight of the composition. Finally, the Examiner argues that Sato allows for the addition of other additives to the composition, including non-borated imide ashless dispersants, and thus concludes that Sato teaches the claimed elements. Applicants respectfully traverse this rejection as follows.

Initially, Applicants respectfully traverse the Examiner's understanding of Sato, and namely, the Examiner's suggestion that Sato teaches claimed component (D), a succinimide compound represented by formula (3) or (4). Sato indeed teaches boron-containing succinimides but does not teach or suggest non-borated succinimides represented by formula (3) or (4) as claimed. In Table 1 of Sato, only Comparative Example 3 contains succinimide 9, having a molecular weight of 1400 and no boron atom. However, no structure for this compound is taught.

The succinimide compounds used in the presently claimed invention have maximum average molecular weights (Mw) of 621 (mono-imide) and 1053 (bis-imide), respectively, based on the assumptions that R^{11}, R^{14}, and R^{15} in formulas (3) and (4) are each $C_{25}H_{51}$ (longest possible carbon chains) and that the polyamine is tetraethylenepentamine, H_2N-(CH_2-CH_2-$NH)_4$-H, which has been typically used in the art. Similarly, the presently claimed succinimide compounds have minimum MWs of 439 (mono-imide) and 689 (bis-imide), respectively, assuming that R^{11}, R^{14} and R^{15} in formulas (3) and (4) are each $C_{12}H_{25}$ (shortest possible carbon chains) and the polyamine is tetraethylenepentamine H_2N-(CH_2-CH_2-$NH)_4$-H, which has typically been used in the art. Therefore, the molecular weights of the succinimide compounds used in the presently claimed invention range from 439 to 1053. Similarly, in the inventive examples (see footnotes of Table 1-1 at page 46 of the present application), compound (4) is diethylenetriaminebis(iso-octadecenyl=C_8) succinimide, having a molecular weight of 771, and compound (5) is tetraethylenepentamine bis (iso-octadecenyl=C_8) succinimide, having a molecular weight of 857. Such low molecular weight non-borated succinimides are not taught or suggested by Sato.

As noted above, Sato only exemplifies (in a Comparative Example) a non-borated succinimide having a molecular weight of 1400, but does not teach or suggest the claimed low molecular weight succinimide having formula (3) or (4). In fact, in col. 9, lines 50-53, Sato teaches away from including a succinimide having no boron, explaining that utilization of such a

compound results in a low coefficient of friction between metals. Accordingly, Sato does not teach or suggest a succinimide having formula (3) or (4) as claimed.

Claim 2 of the present application recites that the sulfur-phosphorus additive, component (C), is a phosphorus compound represented by formula (1) and/or (2) and ammonia and amine salts thereof. Although Sato discloses thiophosphate esters and thiophosphite esters (col. 4, lines 45-50) as wear preventing agents, Sato does not teach or suggest the claimed SP additives. Therefore, based on Sato, even one skilled in the art would not arrive at the invention recited in claim 2 because Sato does not teach or suggest the inventive effects achieved by combining an SP additive and the specifically claimed succinimide.

Accordingly, for all of these reasons, Sato does not teach or suggest the presently claimed invention. Further, it would not have been expected based on Sato that the addition of the specifically claimed succinimide compound, component (D), is very effective at achieving excellent anti-shudder properties and improved fatigue life because Sato is completely silent as to the use of the claimed succinimide compound with a relatively low Mw. Reconsideration and withdrawal of the § 103(a) rejection based on Sato are respectfully requested.

Rejection Under 35 U.S.C. § 103(a) Based on Ogano

The Examiner argues that Ogano teaches a lubricating oil composition for internal combustion engines comprising a base oil composed of a mineral oil, synthetic oil, or mixtures thereof, incorporated with (A) an overbased calcium salicylate having a TBN in the range of 30-100 mgKOH/g in an amount of 0.05 to 0.90 weight % as calcium and (B) a succinimide selected from: (1) a boron-containing succinimide having a weight-average molecular weight of 3,000 or less at 0.04 weight % or less as boron, (2) a non-borated succinimide having a weight average molecular weight of 3,000 or less at 0.01 to 0.25 weight % as nitrogen, and (3) mixtures thereof. Ogano allegedly teaches that the base oils may be used individually or in combination and have a kinematic viscosity of 2 to 20 mm^2/s at 100°C. Ogano allegedly allows for the addition of other additives to the compositions, including phosphoric acid esters and phosphorus acid esters as antiwear agents which may be used in amounts of 0.1 to 5% by weight. The Examiner thus concludes that Ogano teaches the claimed elements. Applicants respectfully traverse this rejection as follows.

As noted above, the presently claimed composition contains a non-borated succinimide having formula (3) or (4). In contrast, Ogano teaches the Mw of a non-borated succinimide

dispersant which is either 3000 or less, preferably 2000 or less, or 2500 or less, preferably 2100 or less, depending on the embodiment to which the invention is applied, as described at col. 5, line 64 to col. 6, line 44 of Ogano. In particular, as set forth in Tables 1-3 at cols. 9-16, the Mws of the non-borated succinimide dispersants which are exemplified are 2065 or 2567 as polybutene. That is, these are the molecular weights of the polybutenyl group (see col. 6, lines 27-29 and "MW" in the footnotes of the Tables). Therefore, if the non-borated succinimide compounds of Ogano are assumed to be of a mono-imide type, the total MWs thereof are 2770, 2370, 2335, and 2837, respectively, based on polybutene molecular weights of 2500, 2100, 2065, and 2567. These molecular weights are far greater than that of the claimed component (D), and it would not have been expected based on the teaching of Ogano that inclusion of the specific low molecular weight component (D) as claimed would provide the observed properties.

Additionally, the non-borated succinimide of Ogano has a different structure than the claimed compound. That is, the succinimide of Ogano has a polyalkenyl or polyalkyl structure (i.e., an alpha-olefin oligomer structure, see Ogano col. 5, lines 2 and 13) which is completely different than the claimed structure having an alkyl or alkenyl group with 12-25 carbon atoms (page 22, lines 6-10 of the present application). For these reasons, Ogano does not teach or suggest the claimed component (D).

Claim 2 recites that the sulfur-phosphorus additive, component (C), is a phosphorus compound represented by formula (1) and/or (2) and ammonia and amine salts thereof. Although Ogano also teaches various anti-wear agents at col. 7, lines 28-41, Ogano does not teach or suggest the claimed SP additives. Therefore, based on Ogano, even one skilled in the art would not arrive at the invention recited in claim 2 because Ogano does not teach or suggest the inventive effects achieved by combining an SP additive and the specifically claimed succinimide.

Accordingly, for all of these reasons, Ogano does not teach or suggest the presently claimed invention. Further, it would not have been expected based on Ogano that the addition of the specifically claimed succinimide compound, component (D), is very effective at achieving excellent anti-shudder properties and improved fatigue life because Ogano is completely silent as to the use of the claimed succinimide compound with a relatively low Mw.

Reconsideration and withdrawal of the § 103(a) rejection based on Ogano are respectfully requested.

Rejection Under §103(a) Based on Bovington

Finally, the Examiner argues that Bovington teaches a low viscosity lubricating oil composition having no more than 0.16 mass % phosphorus, preferably less than 0.09 masss %, which comprises a lubricating oil basestock and, as additives, (a) from 1-10 mass% of a dispersant including borated and non-borated succinimides, (b) 0.05 to 0.6 mass % elemental calcium derived from one or more detergents, and optional additives including zinc dihydrocarbyl dithiophosphate, an antioxidant, a pour point depressant, and a viscosity modifier. Bovington allegedly teaches that the dispersants contain about 0.01 to 0.1 mass % boron as elemental boron, that the detergent component can have a TBN in the range of 15 to 600, and that suitable detergents include calcium salicylates. Therefore, the Examiner concludes that Bovington teaches the claimed elements. Applicants respectfully traverse this rejection as follows.

Bovington teaches an ashless dispersant containing a borated or non-borated polyisobutenyl succinimide wherein the Mw of the polyisobutenyl group is from 950 to 3000 as seen in col. 5, lines 26-36 and claim 2. That is, the Mws of such succinimides range from 1220 to 3270 when calculated from the Mws of the polyisobutenyl group. These molecular weights are outside of the range of the molecular weights of the presently claimed component (D), 439 to 1053, calculated above. Additionally, like Ogano described above, Bovington's non-borated succinimide is different in structure from the claimed non-borated succinimide. For these reasons, Bovington does not teach or suggest the claimed component (D).

Claim 2 recites that the sulfur-phosphorus additive, component (C), is a phosphorus compound represented by formula (1) and/or (2) and ammonia and amine salts thereof. Although Bovington teaches ashless dithiophosphates (col. 8, lines 36-40) as anti-wear agents, Bovington does not teach or suggest the claimed SP additives. Therefore, based on Bovington, even one skilled in the art would not arrive at the invention recited in claim 2 because Bovington does not teach or suggest the inventive effects achieved by combining an SP additive and the specifically claimed succinimide.

Accordingly, for all of these reasons, Bovington does not teach or suggest the presently claimed invention. Further, it would not have been expected based on Bovington that the addition of the specifically claimed succinimide compound, component (D) is very effective at achieving excellent anti-shudder properties and improved fatigue life because Bovington is completely silent as to the use of the claimed succinimide compound with a relatively low Mw.

Reconsideration and withdrawal of the § 103(a) rejection based on Bonvington are respectfully requested.

Based on the preceding Amendments and Remarks, Applicants respectfully submit that the pending claims are patentably distinct from the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

Eitaro MORITA

August 1, 2007 By: _____
(Date)

SANDRA M. KATZ
Registration No. 51,864
AKIN, GUMP, STRAUSS, HAUER & FELD, L.L.P.
One Commerce Square
2005 Market Street - Suite 2200
Philadelphia, PA 19103-7086
Telephone: (215) 965-1200
Direct Dial: (215) 965-1344
Facsimile: (215) 965-1210
E-Mail: skatz@akingump.com

SMK:smk
Enclosure: Petition for Extension of Time (one month)